affected and contralateral hip are the most important predictors of hip osteoarthritis progression ($p < 0.01$). (Figure 1, area a and b). Similarly, there are size differences between progressors and non-progressors in the superior part of the femoral head and trochanter major. However the KL score of the affected side was still the most relevant variable in the prediction of OA progression.

Conclusions: DXA parameters can significantly contribute to predict future progression of joint space narrowing or total hip replacement in patients with (beginning) hip osteoarthritis. The analysis of the DXA differences between two hips of the patient represents a small but significant contribution to this prediction. These analyses show the importance of bone density changes in the etiology of OA. Accurate measurements of bone density and bone shape can help to diagnose OA and predict its chances of fast progression.

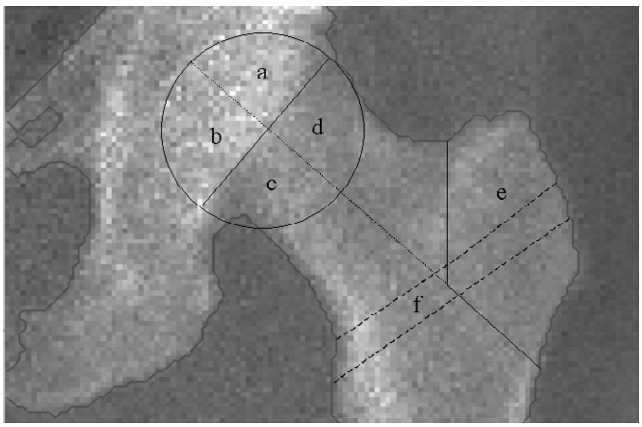

Figure 1. Important areas of division of the hip using DXA analysis. These areas show differences with respect to its contralateral side in those OA patients where the disease will progress. (a) superior, (b) medial, (c) inferior, (d) lateral parts of the femoral head, (e) black lines demarking trochanter major area, (f) broken lines limit the intertrochanteric area.

421 SIDE-DIFFERENCES OF FEMOROTIBIAL CARTILAGE LOSS IN KNEE OA

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Purpose: Osteoarthritis of the knee is often considered to be a bilateral disease, in which one knee (i.e. the functionally dominant one) may be more advanced than the contralateral knee. Also, in studies testing intra-articular DMOADs, the question arises to what extent the contralateral (untreated) knee can be used as a control. It is, however, currently unclear to what extent cartilage loss correlates in left and right knee, and whether cartilage loss in the dominant knee precedes or is greater than that in the non-dominant knee. Here we study the correlation of femorotibial cartilage loss in bilateral knees of community-recruited persons with knee OA using quantitative MR imaging, and we test the hypothesis that cartilage loss in the dominant knee is greater than in the non-dominant knee due to the higher mechanical loading encountered by dominant knees.

Methods: We studied the left and right knees of 124 participants (age 72±9 years [mean±SD], BMI 29.9±5.5, 72% women), with mild to moderate symptomatic OA in at least one knee. Double oblique coronal FLASHwe MRI sequences were acquired bilaterally at baseline and 26.6±5.4 months later. Segmentation of the cartilage was performed by tracing the total subchondral bone area (tAB) and the cartilage surface (AC) throughout the weight-bearing femorotibial cartilage plastes with baseline and follow up scans being processed in parallel (readers blinded to acquisition order). All segmentations were quality controlled by one observer. The cartilage thickness (ThCtAB) was determined using proprietary software (Chondrometrics, Ainring, Germany). Progression was expressed as change in ThCtAB per annum in the medial (MT) and lateral tibia (LT), in the medial (cMF) and lateral weight-bearing femur (cLF) and for aggregate values in the medial and lateral femoro-tibial compartment (MFTC/LFTC).

Results: The correlation for cartilage thickness loss between left and right knees was $r = 0.23$ in the medial and $r = 0.32$ in the lateral femoro-tibial compartment. Medial cartilage loss was 0.8% annually in non-dominant and 1.1% in dominant knees ($r = 0.23$); with the rate of change not being significantly different (Table 1).

Table 1: Rate of annual cartilage loss and correlation between dominant and non-dominant knees

	Dominant Knee	Non-dominant Knee	p value (dom. vs. non-dom.)	Correlation
MT	−1.1%	−0.9%	0.61	0.34
cMF	−1.2%	−0.7%	0.29	0.17
LT	−1.1%	−1.4%	0.37	0.31
cLF	−0.7%	−1.0%	0.43	0.401

In the lateral femorotibial compartment, the rate of change was 1.2% in non-dominant and 0.9% in dominant knees ($r = 0.46$), again the rate of change not being significantly different (Tab. 1).

Conclusions: It is known that cartilage morphology (thickness, volume) in healthy persons is highly symmetric between dominant and non-dominant knees (no significant difference) and displays a high correlation. However, bilateral cartilage loss in OA has not been studied systematically using quantitative MR imaging. In this study of participants with symptomatic and radiographic OA of at least one knee, we do not find significant differences in cartilage loss between dominant and non-dominant or between left and right knees. The correlation of cartilage loss between dominant/non-dominant or left/right knees was only modest. These data provide no evidence that cartilage loss in functionally dominant knees is greater than in contralateral (non-dominant) knees and that the mechanical loading associated with limb dominance is a risk factor for OA progression.

422 STATISTICAL SHAPE MODELLING REVEALS FOCAL PATTERN OF CARTILAGE LOSS IN OAI PROGRESSION COHORT

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Purpose: MRI offers the opportunity to assess the integrity of articular cartilage directly. However, in order for this information to be of most value, it is important to understand the pattern of change as the disease progresses.

The objective is to determine (1) the change in cartilage thickness and (2) the distribution of any such change in a 12-month progression group of individuals with knee OA, comparing the pattern in men and women.

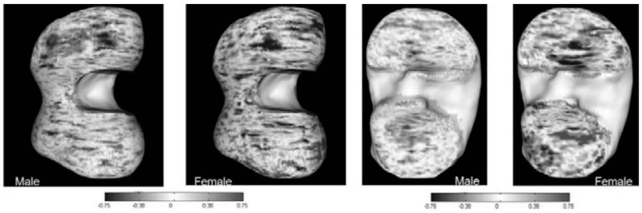
Methods: A convenience group of 50 individuals (29 male) was identified from the OAI progression group 0.B.1 and 1.B.1. The subjects chosen had K-L scores of 2 or 3; medial JSN greater than lateral JSN, evidence of medial osteophytes and knee alignment of $\geqslant$1º of varus mal-alignment measured using the anatomic axis. BMI and varus (average) were for females (32.7, −3.1º) and males (31.3, −3.9º).

Pairs of images were manually segmented using EndPoint software (Imorphics, Manchester, UK), by trained segmenters blinded as to time point, but not to subject. A dense set of anatomically corresponded points was automatically identified on the femur ($n = 6000$) and tibia ($n = 5000$) bone surface of each image, allowing mapping of cartilage change both within and across subjects. Average thickness (ThCtAB) of the cartilage for each major compartment of the femur and tibia was calculated and loss between the baseline and 12m follow-up assessed using paired t-tests with results expressed as a percentage of the baseline mean. At each point at which the thickness of cartilage was measured, the standardized response mean at each point across the population were calculated.

Results: The percentage change in average thickness for males and females by compartment, and by sex of subject is shown in Table1. Distribution of SRM values plotted on mean bone shapes for males and females is shown in Figure 1.

Table 1: % Change in average thickness by compartment, and by sex of subject

	ALL (n = 50)			Females (n = 21)			Males (n = 29)		
	%	SRM	p	%	SRM	p	%	SRM	p
MF	−4.69	−0.723	0.00001	−4.38	−0.74	0.003	−4.89	−0.719	0.001
MT	−2.64	−0.279	0.05440	−2.42	−0.169	0.448	−2.78	−0.489	0.014
LF	0.64	0.145	0.31142	1.73	0.422	0.068	−0.05	−0.011	0.952
LT	−1.37	−0.354	0.01558	−0.93	−0.185	0.406	−1.63	−0.513	0.010



Conclusions: The amounts of change in the articular knee cartilage of this OAI progression group agreed well with other published authors The pattern of cartilage loss on both the femur and tibial plateau is broadly within the meniscal window, although the change is focal and variable. Females seem to show greater dynamic range of cartilage thickness gain as well as loss than males. This data suggests the need to treat males and females independently in any clinical study of the disease.

423 ULTRASONOGRAPHIC FINGER JOINTS EXAMINATION IN HAND OSTEOARTHRITIS

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Purpose: To compare US and radiographic features in patients with hand OA (HOA).

Methods: We studied 16 outpatients with symptomatic HOA, according to ACR classification criteria. Metacarpophalangeal, distal and proximal interphalangeal joints of all patients were evaluated by ultrasound (US) examination (7.5−15 MHz linear array), performed on both hands on volar and dorsal sides. Anteroposterior conventional radiographs of both hands in all patients were performed and the radiological involvement of the single joints has been graded by Kellgren-Lawrence's (K-L) and Kallman's system. Synovial volume, power Doppler (PD) signal (present/absent), and erosions (defined as a cortical break $\geqslant$2 mm) were analyzed. Joints with ankylosis were excluded from the US evaluation. Student's T or Mann-Whitney (if no Gaussian distribution of the data) were used to compare quantitative variables.

Results: We analysed 444 joints by US; all these where assessed by K-L scoring system and 284 by Kallman's one (Kallman score does not take into account the metacarpophalangeal joints). PD positive joints were 40 (9%) out of the K-L considered ones and 32 (11%) out of the Kallman's considered ones. Joints with US detected erosions were 35 (8%) out of the K-L considered ones and 36 (13%) out of the Kallman's considered ones. Relationship between presence of PD signal and radiological scores are shown in the table. Furthermore, PD positive joints showed a higher number of US detected erosions (0.4±0.9 vs 0.2±0.6, p = 0.017). Patients with US detected erosions had significant higher K-L and Kallman's score (p < 0.0001 for both). No significant association was observed between radiological grading and synovial volume.

Conclusions: In our series of HOA patients, about 10% of the finger joints show features of inflammation and erosive disease associated with higher radiological scores. A prospective follow up study is necessary to evaluate the diagnostic and prognostic value of US examination of HOA.

Table 1: Relationship between ultrasound and radiological scores

	PD positivity	PD negativity	p
Kellgren-Lawrence's, mean, sd (CI 95%)	2.1±1.2 (1.7−2.5)	1.5±1.0 (1.4−1.6)	0.01
Kallman's, mean, sd (CI 95%)	6.2±2.0 (5.5−6.9)	5.2±2.0 (4.9−5.4)	0.05

424 RELATIONSHIP OF ADIPOSITY TO INFLAMMATORY COMPONENTS OF KNEE OSTEOARTHRITIS (OA): THE MOST STUDY

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Purpose: Increased body mass index (BMI) is associated with incident knee osteoarthritis (OA) and knee pain severity. Biomechanical factors play a role in this association, but inflammatory mediators have also been implicated, and visceral adipose tissue is an important site of cytokine production. The Multicenter Osteoarthritis Study (MOST) is a NIH-funded longitudinal study of subjects who either have knee OA or are at high risk of developing it. Demographic and radiographic data, whole body DEXA scans and Gd-DTPA enhanced MRI of one knee were obtained. We tested for association of adipose tissue as well as weight, BMI, lean body mass (LBM)), and whole body bone mineral density (BMD) measures with MRI evidence of synovitis.

Methods: 30 month Gd-DTPA enhanced MRI images and baseline whole body DEXA (Hologic QDR-4500W) were available on 521 subjects. Fat mass (total and trunk), LBM, and total BMD were calculated utilizing DEXA. MRI synovitis (range 0−3) was scored from 6 compartments of the knee and categorized as: 0-normal; 1-mild; 2-moderate; 3-severe. BMI and weight were obtained at baseline. Predictor variables were separated into sex-specific quartiles and analyzed comparing the highest to lowest quartiles. Sex-specific univariate and multivariate ordinal logistic regression were performed.

Results: The mean age of subjects was 59.6±7.2; 50.5% were female, and 86.5% were Caucasian. Mean baseline BMI was 29.5±4.7, weight 190.7±36.3 lbs, % fat mass total 32.0±8.4, abdominal fat mass/total fat mass 49.3%±7.1%, LBM 56,563±12,694 gms, and total BMD 1.16±0.13 gm/cm^2. MRI evidence of synovitis was present in 75% of subjects.

In women, synovitis was positively associated with % fat mass total (*); however, this lost significance when adjusting for weight (**) (see Table 1). In men there was no significant association between % fat mass total and synovitis in the univariate analysis (*), but a significant inverse association was present in the model adjusted for weight (**). BMI, weight and LBM were positively associated with synovitis in women. In men, only LBM and total BMD were positively associated with synovitis.

Conclusions: We did not find an independent positive association between fat mass and knee synovitis. The sex-based differences observed highlight the possibility of different pathological pathways playing different roles among men and women.

Table 1: Association of body size measures and synovitis

Predictor	Synovitis* Women OR (95% CI), P value	Synovitis** Women (weight adj.) OR (95% CI), P value	Synovitis* Men OR (95% CI), P value	Synovitis** Men (weight adj.) OR (95% CI), P value
BMI	4.0 (2.0−7.9) P < 0.0001	3.2 (0.6−16.1) P = 0.1674	1.7 (0.9−3.3) P = 0.1272	1.2 (0.2−5.9) P = 0.8459
Weight (kg)	2.5 (1.2−4.9) P = 0.0094	X	2.0 (0.9−4.2) P = 0.0755	X
% fat mass total	2.9 (1.5−5.7) P = 0.0018	1.4 (0.5−3.5) P = 0.5127	0.6 (0.3−1.2) P = 0.1224	0.2 (0.1−0.5) P = 0.0010
Abdfat/total body fat	1.4 (0.7−2.7) P = 0.2807	1.0 (0.5−1.9) P = 0.9320	1.3 (0.6−2.5) P = 0.4805	1.0 (0.5−2.0) P = 0.9466
Lean mass total (gm)	3.3 (1.6−6.9) P = 0.0014	1.0 (0.3−3.1) P = 0.9960	3.3 (1.5−7.3) P = 0.0037	4.5 (1.4−14.6) P = 0.0127
Bone density total (gms/cm^2)	1.6 (0.8−3.2) P = 0.1610	1.5 (0.8−3.0) P = 0.2472	2.9 (1.4−6.0) P = 0.0037	2.8 (1.4−5.8) P = 0.0055

*Adj. for age, race, height; **Adj. for age, race, height, and weight

425 ASSESSMENT OF BONE MARROW EDEMA-LIKE LESIONS AND CARTILAGE DEGENERATION IN OSTEOARTHIRITS USING 3T MR T1RHO QUANTIFICATION

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Purpose: To quantitatively assess the relationship between bone marrow edema-like lesions (BMEL) and the associated cartilage in knee osteoarthritis (OA) using $T_{1\rho}$ quantification at 3T MRI.

Methods: Twenty-three patients (10 male, 13 female, mean age 51.8±11.2 years) with clinically diagnosed knee OA underwent MRI at 3T (Signa, GE Medical Systems). Radiographs were also obtained and scored based on Kellgren-Lawrence (KL) scales (number of patients = 10, 10, 2, 1 for KL = 1, 2, 3, 4 respectively). Clinical symptoms were quantified using Western Ontario and McMaster University (WOMAC) scores in all patients. The MRI protocol included sagittal intermediate-weighted fat-saturated FSE images, sagittal 3D water excitation high-resolution SPGR images and sagittal 3D $T_{1\rho}$ quantitation sequences previously developed in our lab. BMEL were semi-automatically segmented in FSE images